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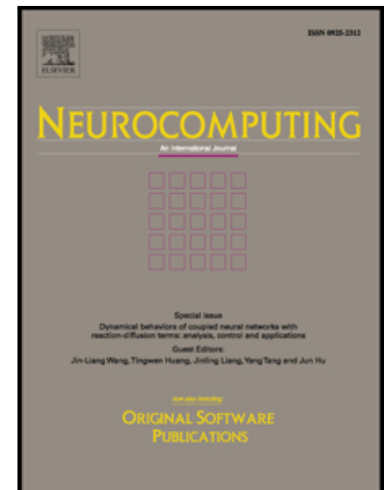
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Neuro-Adaptive Observer based Control of Flexible Joint Robot

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Abstract

Due to high nonlinearity, strong coupling and time-varying characteristics of flexible joint robot manipulators, their control design is generally a challenging problem. There are inevitable uncertainties associated with their kinematics and dynamics, so that accurate models would not be available for control design. Furthermore, practically we may face the problem that state variables required by the controller are not measurable. In this paper, we focus on the study of control system design using a neural network observer to solve the aforementioned unmeasurable problem. First, we propose an observer based on Radial basis function (RBF) neural network to estimate state variables of the normal system. We then design the controller based on dynamic surface control method for a single link flexible joint manipulator whose model is unknown. The unknown model of the manipulator is constructed by RBF neural network. The stability of the observer and controller is shown by Lyapunov method. Finally, simulation studies are performed to test and verify the effectiveness of the proposed controller.

Keywords: Flexible joint manipulator system; Dynamic surface control; Neural network; State observer

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